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EXAMINER	
YEE, DEBORAH	

ART UNIT	PAPER NUMBER
1793	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/724,637

Applicant(s)

MICHAUD ET AL.

Examiner

Deborah Yee

Art Unit

1793

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 August 2007 and 20 August 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1, 6 to 13 and 15 to 17 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 6 to 13 and 15 to 17 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1, 6 to 13 and 15 to 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bellus et al (US Patent 5,820,706) in view of Bone (US Patent 6,786,073) or Vodopyanov et al (US Patent 6,094,956) for the reasons set forth in the previous office action dated March 14, 2007.

Response to Arguments

2. Applicant's arguments filed August 14, 2007 and August 20, 2007 have been fully considered but they are not persuasive. It was stated that Bellus et al do not recognize the importance of the particular steel composition recited by Applicants. It was pointed out that B is not compulsory in Bellus et al., contrary to Applicants' invention, which requires 5-50 ppm. It is the Examiner's position that although B is optional by prior art, it still can be present at 5-100 ppm and encompasses present invention B range of 5-50ppm. Moreover, Bellus discloses specific examples 2 and 3 in column 5 that contain 30ppm and 33ppm, respectively and are within present invention B range of 5-50.

3. Similarly, it was argued that present invention requires 0.005 to 0.04% Ti with

Art Unit: 1793

Ti \geq 3.5 times the N content of the steel whereas prior art teaches Ti as optional and no N is disclosed. Regardless of whether Ti is optional, it still can be present at 0.005 to 0.03% which overlaps with Applicants' range of 0.005 to 0.04%. Moreover specific examples 2 and 3 in column 5 contain 0.023% Ti and are within the claimed Ti range of 0.005 to 0.04%. Also since N is not taught by Bellus et al., then said element is either not present or present as an inevitable impurity at a conventional level typically less than 0.005%; and hence would satisfy the equation recited by Applicants.

4. Applicants stated that prior art does not recognize the importance of uncombined B to displace the ferrite field to the right of the TRC diagram to avoid the formation of ferrite during slow cooling so that 100% bainite is obtained and to achieve uncombined B, the Ti needs to be present \geq 3.5 times the N content of the steel. It is the examiner's position that even though the technical explanation is not disclosed by Bellus, it still discloses a bainitic steel alloy composition having constituents whose wt% ranges overlap those recited by the claims, and more specifically prior art example 2 in column 5 that closely approximates the claimed composition.

5. It was argued that Nb is not compulsory in Bellus et al., and none of its examples contain Nb. It is the examiner's position that even though Bellus et al teach 0.005 to 0.06% Nb as optional, it still can be present and is within the same wt% range of 0.005 to 0.06% Nb recited by Applicants. Moreover, it would be obvious for one of ordinary skill in the art to include Nb to prior art examples since Nb is taught as an alloying constituent.

Art Unit: 1793

6. Applicants provided supplementary examples 1 and 2 to demonstrate the presence of Nb is important to help obtain 100% bainite microstructure. Moreover, the presence of Nb within the require range allows widening of the bainite field. This ensures that all slow and long cooling (3C/sec or less) while the steel is between 600 to 300C, will be directly crossed through the bainite field, without any passage through the ferrite field which would cause a significant proportion of ferrite to remain in the final microstructure. It is the examiner's position that the presence of Nb does not appear too critical since Applicants' inventive examples on lines 25 to 29 on page 12 and on lines 33-37 on page 13 do not contain Nb yet still can be cooled at less than 3C/sec and obtain a bainite microstructure. In any event, prior art teaches 0.005 to 0.06% Nb can be added to the steel and hence would not patentably distinguish over prior art.

5. Applicants' further stated that Bellus et al require a minimum cooling speed of 0.5C/s after hot forging to place the steel in front of or within the lower bainite field before holding it within this field during at least 2 minutes, in order to obtain a significant proportion of lower bainite, that is at least 15%. In contrast, Applicants' invention requires a maximum cooling speed, that is 3C/s, the cooling speed being possibly less than 0.5C/s, for ensuring that the bainite field will be attained, and by its upper part, and so that upper bainite will be privileged in the final 100% bainite microstructure.

6. It is the Examiner's position that even though Bellus et al require a minimum cooling speed of greater than 0.5C/s, it still encompasses and therefore suggest present invention cooling speed of less than or equal to 3C/sec. Moreover, prior art example 2 is cooled at 2.6C/s and is within Applicants' claimed range of ≤ 3 C/sec. Also as pointed

Art Unit: 1793

out by Applicants, present invention cooling rate of $\leq 3\text{C/sec}$ includes cooling at less than 0.5C/s but this does not overlook the fact that present invention cooling rate can also be above 0.5C/sec .

7. Moreover, Applicants stated that present invention is directed to a final 100% bainite microstructure containing upper bainite yet this feature is not actively recited by the claims and hence would not be a patentable consideration. Note Applicants' claims merely recite, "imparting a bainite microstructure"; hence prior art lower bainite would satisfy present invention claimed limitation of "bainite". Also present invention does not appear to have 100% bainite in view of Applicants' specification on lines 11 to 10 and 21 to 28 on page 11 wherein present invention steel contains the presence of residual austenite and can be converted to ferrite and carbides by annealing before or after machining.

8. Applicants stated that upper bainite is needed in the present invention to impart good endurance and ability for being mechanically reinforced by deep rolling operation, and lower bainite would not be efficient on this point. It is the Examiner's position that "upper bainite" is not recited by the claims and hence would not be a patentable consideration. Moreover, Applicants assertion that lower bainite would not be suited for deep rolling operation is merely a statement without any convincing evidence (comparative test data).

9. Applicants on page 15 of their remarks provided a supplementary reference example to show that a steel made according to Bellus et al. would not be able to fulfill the requirements of Applicants' invention. It is the Examiner's position that

Art Unit: 1793

supplementary reference example is ineffective because it is not representative of the closest prior art taught by Bellus et al. because Applicants' test example does not contain Ti or B yet the closest prior art example 2 in column 5 of Bellus et al contains Ti and B. Note the minimum requirement for comparative data must be with the closest prior art example.

10. Applicants provided Documents 3 and 4 to illustrate the differences between the processes of the prior art and present invention. It is the Examiner's position that Bellus et al on lines 1 to 25 in column 5 disclose bainitic steel example 2 processed in substantially the same manner as claimed by Applicants comprising the steps of forging at a temperature between 1270 to 1040 C (overlaps claimed forging temperature of 1100 to 1300C), directly cooling at 2.6 C/s after forging to 400C and holding at 400C for 380C for 10 minutes (within claimed cooling rate of less than or equal to 3C/s and overlaps with the temperature range of 600 to 300C), and annealing at 550C for 1 hour (closely within optional annealing at 300 to 500C). Moreover, similar to present invention, Bellus et al on lines 6 to 11 in column 4 teaches annealing step as optional and can be omitted. Even though Bellus et al. teach isothermal step, such would not be excluded from present invention claim reciting "comprising" which is inclusive of unrecited steps. In addition present invention cooling rate of less than or equal to 3C/s would have a lower limit of zero; hence isothermal step could be included.

11. Even though Bellus et al do not teach deep rolling, Examiner maintains her position that it would be obvious to incorporate deep rolling since it is conventional practice as evident by secondary references to deep roll hot forged crankshafts at

locations that are to be subjected to high levels of stress to generate high compressive stress of 800 to 1200daN to thereby improve fatigue strength. Applicants stated that steel of Bellus et al. is not suited for deep rolling because prior art structure contains at least 15% lower bainite but this is merely an assertion without any convincing evidence.

Conclusion

12. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Deborah Yee whose telephone number is 571-272-1253. The examiner can normally be reached on monday-friday 6:00 am-2: 30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King can be reached on 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1793

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Deborah Yee/
Primary Examiner
Art Unit 1793

/DY/